

# BOTANY

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## **Project title: Vascular Flora of the Greater Yellowstone Area**

Principal investigator: Mr. Erwin Evert  
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Objective: To collect vascular plant specimens as vouchers for distribution maps to be included in the investigator's "Flora of the Greater Yellowstone Area."

Findings: Nine species previously unreported for YNP: *Carex scirpiformis*, *Antennaria lanata*, *Eriogonum umbellatum* var *dicrocephalum*, *Carex rupestris*, *Antennaria aromatica*, *Carex submigricans*, *C. spectabilis*, *Dryopteris filix-mas* and *Valeriana acutiloba*.

## **Project title: Above- and Below Ground Carbon Allocation in Developing and Mature Lodgepole Pine Forests in Yellowstone National Park**

Principal investigator: Dr. Dennis Knight  
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Additional investigator(s): Creighton M. Litton, Michael G. Ryan

Objective: Fire and landscape variables interact to produce a mosaic of different vegetation types. The resulting spatial heterogeneity in tree density, herbaceous cover, and species composition that has been observed in Yellowstone National Park will influence primary production and carbon storage for many years. Therefore, to determine the long-term effects of fire on carbon release and storage during succession, we must understand how processes differ among sites as a function of community structure. Our research focuses on the effects of differences in growth-form composition (i.e., relative abundance of trees and herbaceous plants) on above- and below ground carbon dynamics following the 1988 fires in Yellowstone National Park. The general objectives are to answer two questions: 1) How do above- and below ground carbon storage and flux values differ in 12-year-old post-fire stands with different proportions of trees and herbaceous plants? 2) How do above- and below ground carbon storage and flux values in stands burned 12 years ago differ from comparable values in nearby mature forests with similar soils? Answering these questions will enable us to look more holistically at the effects of differences in growth-form composition on carbon allocation across the Yellowstone landscape where lodgepole pine (*Pinus contorta* var. *latifolia*) is

the dominant species.

Findings: A four month field season during summer 2000 allowed significant progress on our study, including: 1) the location and establishment of all plots; 2) measurement of soil CO<sub>2</sub> efflux at four different times; 3) estimation of herbaceous aboveground net primary productivity; 4) estimation of litterfall rates for summer 2000; 5) collection of soil samples for estimating soil organic matter, root carbon pools, and physical properties (i.e., bulk density and texture, plus microbial biomass); 6) collection of stand basal area data for estimation of dead coarse woody root carbon pools; 7) placement of ion exchange resin bags for estimation of N availability; and 8) collection of samples for estimating litter carbon pools. Most of the samples will be analyzed this winter.

Additional field work during 2001 is required. Specifically, we must: 1) sample soil CO<sub>2</sub> efflux rates early in the summer when soils are saturated from melting snowpack and soil temperatures are still relatively low; 2) complete data collection for aboveground net primary productivity estimation; 3) collect samples for estimating winter litterfall rates; 4) collect ion-exchange resin bags that were placed in the field during September 2000; and 6) resample soil, litter and root carbon pools to provide estimates of change in these compartments.

**Project title: Physiology of Thermotolerant Plants in Yellowstone Park**

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Objective: Our chief objectives for 2000 were to continue to monitor the rhizosphere temperatures of plants growing in several geothermal areas in Yellowstone and to continue a systematic vegetative pattern survey in these areas.

Findings: This year we collected further long-term rhizosphere temperature data regarding the grass species *D. lanuginosum*. These results were in general agreement with results from previous years, that is, the roots of this plant are exposed to temperatures exceeding 40 C for weeks. In addition, we collected vegetative pattern data in selected areas at Amphitheater Springs, 100 Spring Plain and Rabbit Creek. At this time the data is inconclusive regarding correlations between physical factors and species distribution in geothermal areas. We plan to continue this research next year.

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**Project title: Yellowstone Flora**

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**Objective:** The vascular plant flora of Yellowstone, even though investigated for approximately 120 years, is not completely known. The primary focus of this project is to improve the current knowledge of the flora of the park through in-depth collecting, especially of areas in the park that have not been previously studied. This includes inventory of the occurrence and range of native taxa and also involves the documentation of the arrival and spread of exotic species. In addition, collection of specimens for the Yellowstone herbarium will improve the value of the facility for both NPS personnel and outside researchers.

**Findings:** Ongoing inventory of vascular plants and collection for the Yellowstone National Park Herbarium. Eleven species of vascular plants previously not reported or not confirmed as occurring within the park were discovered. *Astragalus inflexus* Dougl ex. Hook. [bent milk-vetch], *Orogenia linearifolia* Wats. [linear-leaved orogenia], *Polygonum minimum* Wats. [broadleaf knotweed], *Antennaria lanata* (Hook.) Greene [woolly pussy-toes], and *Townsendia condensata* Parry ex Gray var. *condensata* were all located or confirmed to occur in the park. These native species are presumed to have been a long-term component of Yellowstone's flora that had been previously overlooked or reported based on material either not collected in Yellowstone or on misidentified material.

Six new exotics to the Yellowstone flora were located within the park. *Ambrosia artemisiifolia* L. [annual ragweed], *Juncus compressus* Jacq. [compressed rush], and *Tamarix chinensis* Loureiro [tamarisk] were located by resource management personnel. In addition, *Arctium lappa* L. [great burdock], *Asparagus officinalis* L. [asparagus], and *Astragalus cicer* L. [chick-pea milk-vetch] were also located within the park. All of these species were either immediately eradicated if possible, or are being actively controlled.